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METHOD FOR OPERATING AN HYDRAULIC ACTUATOR, IN PARTICULAR A  
GAS-EXCHANGE VALVE OF AN INTERNAL COMBUSTION ENGINE

Background of the Invention

The present invention relates to a method for operating an hydraulic actuator, in particular for a gas-exchange valve of an internal combustion engine, in which a movement of an actuating element of the actuator is effected in that a working chamber of the actuator, by means of a valve device, is able to be connected to, and disconnected from, a fluid reservoir in which pressurized hydraulic fluid is stored, the lift of the actuating element of the actuator being a function of a fluid volume present in the working chamber.

Such a method is known from DE 198 26,047 A2, for example. Described there are a device for controlling a gas-exchange valve of an internal combustion engine and the corresponding operating method. A high-pressure pump pumps hydraulic fluid into a piping system in which the hydraulic fluid is stored under very high pressure. A working chamber of an hydraulic cylinder whose piston is connected to a valve element of a gas-exchange valve of an internal combustion engine is connected to the fluid reservoir via a two-way valve. An outlet of the working chamber is also connected to a low-pressure region via a two-way valve. Depending on the valve setting, high or low pressure prevails in the working chamber of the hydraulic actuator and a corresponding fluid volume is present in the working chamber, which affects the piston position.

The advantage of such a gas-exchange valve is that it may be

triggered independently of a setting of a camshaft of the internal combustion engine. For cost reasons, no detection of the instantaneous piston position takes place. As a result, the positioning of the piston of the hydraulic actuator is not able to be regulated but only controlled.

The present invention is based on the objective of further refining a method of the type mentioned in the introduction, in such a way that the actuating element of the actuator is able to be positioned as precisely as possible.

In a method of the type mentioned in the introduction, this objective is achieved in that, to ascertain an instantaneous operating performance of the actuator, the working chamber is briefly connected to the fluid reservoir, the corresponding pressure drop in the fluid reservoir is recorded and the corresponding lift is ascertained from the pressure drop with the aid of known geometric variables of the actuator, and at least one value pair is formed, which is made up of an opening duration and the lift.

#### Summary of the Invention

The ascertained value pair may be compared with a value pair determined on a test stand, for example, or during a previous method run. In this manner age manifestations, changed ambient conditions etc. may be detected and taken into account in the triggering of the valve devices. The outputting of an information when the instantaneous operating performance of the actuator has changed in an impermissible manner is possible as well. This increases the reliability of the actuator operation since it allows countermeasures to be taken even before the operation of the actuator possibly results in damage.

Especially advantageous developments of the method according to the present invention are indicated in the dependent